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Indian Standard
SPECIFICATION FOR
RAIL MILK TANKERS

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Indian Standard

SPECIFICATION FOR RAIL MILK TANKERS

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Indian Standard

SPECIFICATION FOR RAIL MILK TANKERS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 27 July 1972, after the draft finalized by the Dairy Equipment Sectional Committee had been approved by the Agricultural and Food Products Division Council.

0.2 Rail milk tankers are used to transport cooled milk usually over long distances. The rail milk tanker broadly consists of tank(s) with fittings, and railway underframe with its running gear and accessories. This standard covers the requirements for the tank with fittings only. The tank should suit the underframe according to the Rules and Regulations of the Indian Railways.

0.3 The rail milk tankers should be designed for movement by passenger trains operating at high speeds; the milk being perishable product has invariably got to be transported at higher speeds.

0.4 The purchaser is also required to make arrangements for underframes, get the drawings of tanks and axle loads approved by the Indian Railways and arrange to mount the tank on the underframes, through the Indian Railways.

0.5 The overall dimensions of the rail milk tankers with accessories shall not in any way infringe the 'Indian Railway Standard schedule of limiting dimensions and clearances for broad gauge and metre gauge', in force from time to time.

0.6 This standard does not provide for the use of a canopy for the rail milk tankers as it tends to be unhygienic and difficult to clean and does not serve any useful purpose. Moreover, it adds to the cost and reduces the capacity of the tanker as the outer dimensions are restricted by the Railways.

0.7 This standard covers the tankers made of stainless steel only. Another standard for tankers made of aluminium may be formulated later when sufficient data on their suitability are available.

0.8 This standard contains clauses 11.2 and 11.3 which call for agreement between the purchaser and the supplier.

0.9 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS:2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard prescribes the requirements of tanks and fittings for rail milk tankers with inner tanks fabricated from stainless steel.

1.1.1 This standard does not cover specification for railway underframe or its running gear or its accessories or any parts thereof.

2. GENERAL DESCRIPTION

2.1 The tank shall consist of the inner vessel, insulation, outer casing, fittings and mountings, and supports for mounting the tank on the under-frame.

2.2 A typical general arrangement of rail milk tanker is shown in Fig. 1.

3. CAPACITY

3.1 Nominal capacities of the rail milk tanker shall be minimum 20 000 litres or 40 000 litres.

3.1.1 The tanks of nominal capacity of 20 000 litres are recommended for metre gauge and those with 40 000 litres capacity for broad gauge.

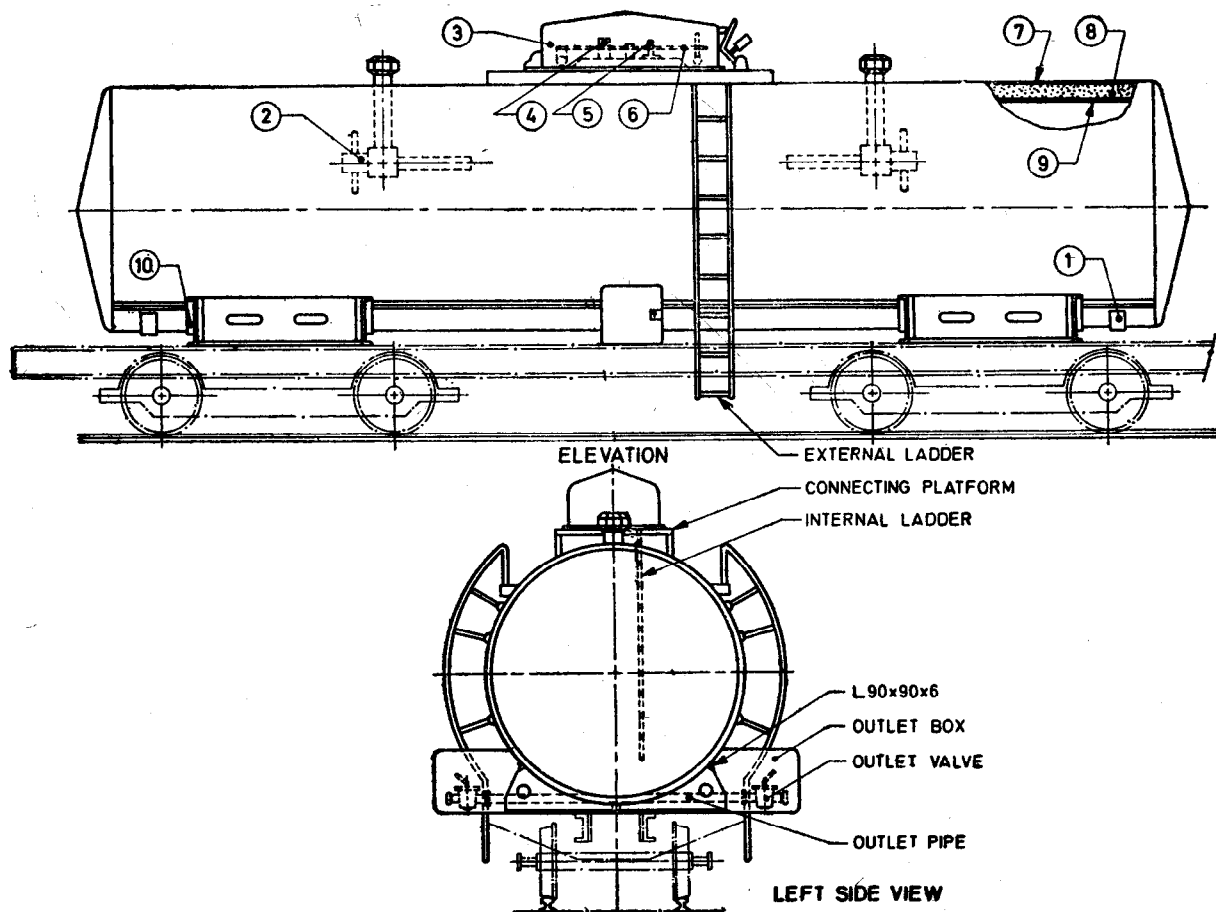
4. SHAPE

4.1 The inner vessel and outer casing shall be of horizontal cylindrical shape with dished ends. In case of 40 000-litre tankers, there shall be either a positive slope of 50 mm with semi-circular sanitary drainage channel or 150 mm without the channel from both ends to the centre of the tank where outlets are located to ensure complete draining of the contents of the tank. In case of 20 000-litre tankers this slope shall be at least 150 mm. The diameters at the ends and at the centre of the inner tank shall differ by 150 mm to provide a positive slope towards the centre for drainage.

5. DIMENSIONS

5.1 The recommended dimensions of rail milk tanks are given in Table 1.

*Rules for rounding off numerical values (*revised*).



- | | |
|---------------------------|-------------------|
| 1 — Lifting Pad | 6 — Manhole Door |
| 2 — Cleaning Device | 7 — Outer Vessel |
| 3 — Dust Cover | 8 — Insulation |
| 4 — Pressure Relief Valve | 9 — Inner Vessel |
| 5 — Vacuum Relief Valve | 10 — Tank Support |

All dimensions in millimetres.

FIG. 1 TYPICAL GENERAL ARRANGEMENT OF RAIL MILK TANKER

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TABLE 1 RECOMMENDED DIMENSIONS OF RAIL MILK TANKS

(Clause 5.1)

Sl No.	VESSEL	NOMINAL CAPACITY, LITRES	
		20 000	40 000
(1)	(2)	(3)	(4)
		mm	mm
i)	<i>Inner</i>		
	Inside dia at the centre	1 850	2 150
	Inside dia at the ends	1 750	2 000
	Inside overall length	8 313	12 416
ii)	<i>Outer</i>		
	Outside dia at the centre	2 061	2 468
	Outside dia at the ends	1 961	2 326
	Outside overall length	8 630	12 800

NOTE — The dimensions of the tanks shall depend on thickness of insulation. These dimensions are based on 150-mm thick insulation.

6. MATERIAL

6.1 The inner vessel, manhole rim, manhole door, dust cover, outlets and outlet valves, pressure and vacuum relief valves and internal ladder shall be made of stainless steel of Grade 07 Cr 18 Ni-9 of 'Indian Standard specification for stainless steel sheet, strip and plate (*under preparation*)' or equivalent.

NOTE — Until the 'Indian Standard specification for stainless steel sheet, strip and plate' is published, the grade of stainless steel shall be subject to agreement between the purchaser and the supplier.

6.1.1 Pressure and vacuum relief valves may also be made of rubber conforming to the requirements prescribed in 6.4.

6.2 The mild steel plates used for construction of outer casing (outer vessel) shall conform to IS : 226-1969* or equivalent.

6.2.1 The external ladders, tank supports, lifting hooks, hinges, bolts, nuts, etc, should be made from structural steel (*see* IS : 226-1969*).

*Specification for structural steel (standard quality) (*fourth revision*).

6.3 Insulation — The insulation may be of glass wool or of plastic foam material or of any other suitable insulating material. However, the quality and thickness of the insulating material shall be such as to prevent in 24 h a temperature rise of not more than 2°C in the tank full of water when the difference between the temperature of water and that of the atmosphere is not more than 35°C. The insulating material should not be affected if the tank is sterilized by steam. The above temperature rise shall not take into consideration the sensible heat that may be stored in the empty tank at the time of filling. Before recording the temperature, the water shall be gently agitated to make the temperature uniform within the tank.

6.4 Material used for sealing shall be rubber of non-toxic, stable and non-absorbent quality and shall have smooth surface and shall not deteriorate when in contact with milk and cleaning agents. The rubber used should preferably be acrylonitrile butadiene copolymer (NBR) of type B3 or polychloroprene of type C3 of IS: 6450-1971*.

7. THICKNESS

7.1 In both types of tankers, the minimum thickness of the mild steel used for outer vessel shall be not less than 6 mm and the thickness of stainless steel used for inner vessel shall be not less than 3.0 mm.

7.1.1 The thickness of insulation shall be minimum of 100 mm.

NOTE — This does not apply where glass wool is used.

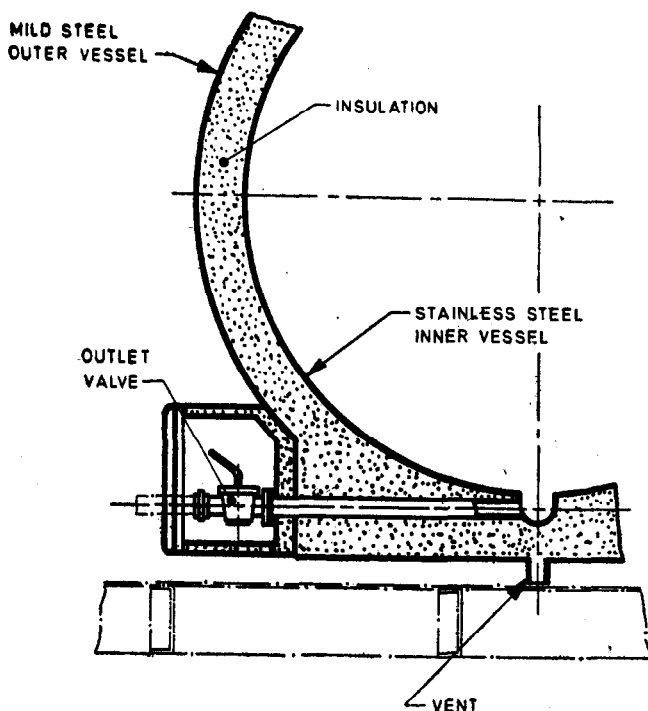
8. FITTINGS

8.1 Vent — There shall be a vent in the outer vessel. A typical design of the vent and its position is given in Fig. 2.

8.2 Manhole — A circular top manhole of a diameter not less than 450 mm shall be provided. The manhole cover shall be hinged to manway rim and be quick-release type. The cover shall be fitted with pressure and vacuum relief valves which are of easily cleanable type. The manhole shall also be provided with a dust cover of hinged and quick-release type. The dust cover shall be provided with a locking device.

8.3 Tank Supports — The saddles for mounting the tank shall be a part of underframe. In order to support the tank on the underframe saddles, 90 × 90 × 6 angle or equivalent profile along the length of the outer vessel may be welded on either side of the tank for anchoring the complete tank to the supports provided on the underframe.

*Specification for rubbers for the dairy industry.



SECTION THROUGH CENTRE OF TANK

FIG. 2 DETAIL OF VENT ON OUTER VESSEL OF RAIL TANKER

8.4 Outlets — Two outlets of diameter either 63.5 or 76.2 mm (*see* IS : 3382-1965*) shall be located at the centre bottom of the tank with the discharge pipes of stainless steel with sufficient slope ending in 63.5 or 76.2 mm two-way valve of stainless steel of sanitary design. Outlet pipes shall be situated as near as possible to the outlet valves. Outlet valves shall be suitably housed in stainless steel boxes with padlock doors. Arrangements shall also be made for drainage of water from the boxes.

8.5 Ladders — One internal vertical stainless steel ladder of flats on the vertical side and rods on the horizontal side shall be provided for getting into the tank. No hollow sections shall be used. Two mild steel ladders shall be provided on the outside of the tank one on each side with connecting platform of stainless steel for having easy access to the manhole portion.

*Specification for stainless steel milk pipes and fittings.

8.6 Cleaning Devices — The 20 000-litre tank shall be provided with two cleaning devices and the 40 000-litre tank shall have four cleaning devices of a design capable of cleaning the entire inside of the tank.

8.7 For lifting the tank, suitable pads welded on the bottom of the outer vessel at either end shall be provided.

9. CONSTRUCTION

9.1 The inner vessel shall be of welded construction with all inner welds ground smooth and polished to sanitary dairy finish. All corners shall have a radius of not less than 35 mm, (except the connection points between the inner and outer tanks at manhole, cleaning device, etc) and ends other than those dished to shell, which shall have a radius of 6 mm. The ends shall be sufficiently stiffened in order to cope with the shunting and braking impacts. Adequate locking shall be provided between inner and the outer vessel to prevent relative movement between the inner and the outer vessels.

9.2 On the outer surface of the inner vessel 100 mm thick insulation material shall be laid in two layers sufficient care being taken to see that the joints of first layer are covered by the second layer. All air space shall be eliminated.

9.3 In case of non-fire-proof insulating material being used, the welding of the outer vessel, when carried out in position at the time of assembly, should be done with special precaution so that the insulating material is not damaged. This may be done by suitable asbestos or fibre glass or other fire-proof insulating materials with suitable thicknesses backing up the welded positions.

9.4 The inner vessel and all attachments made from stainless steel shall preferably be welded by the inert gas arc-welding process using argon as the shielding gas. The filler rods and the bare electrodes for this process shall conform to grade S-BO 1 of IS: 5856-1970*. The steel may also be welded by manual metal arc welding process using covered electordes conforming to grade M-BO 1 of IS: 5206-1969†.

10. FINISH

10.1 All internal welds of inner vessel shall be ground smooth and all internal surfaces polished to a smooth finish.

10.2 All welds of the outer casing, wherever accessible, shall be ground. Welds on tank supports shall be cleaned. All surfaces shall be painted

*Specification for corrosion and heat resisting chromium-nickel steel solid welding rods and bare electrodes.

†Specification for corrosion resisting chromium and chromium-nickel steel covered electrodes for manual metal arc welding.

with an anti-rust primer, using non-corrosive filler where required. Two final coats of synthetic enamel paint shall be applied on the outer casing. The colour of the paint shall be as approved by the Railways.

10.2.1 All the welds on the outside surface of the inner vessel shall be suitably descaled.

10.2.2 Inside of the outer casing shall also be given proper anti-corrosive treatment.

11. TESTS

11.1 The inner vessel after grinding the welds and finishing the surface prior to the application of insulation shall be tested for water tightness by subjecting it to a hydraulic pressure of 0.35 kg/cm^2 for 5 min.

11.2 Radiographic test at the joints may be carried out as agreed to between the purchaser and the supplier (see IS: 1182-1967* and IS: 4853-1968†).

11.3 The quality of the welds shall be tested by the dye penetration method (see IS: 3658-1966‡) and the acceptance limits may be as agreed to between the purchaser and the supplier.

12. MARKING

12.1 The tank shall be marked legibly and permanently with the following particulars:

- a) Manufacturer's name or trade-mark or initials,
- b) Manufacturer's identification, and
- c) Capacity of the tank.

12.1.1 Each tank may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act, and the Rules and Regulations made thereunder. Presence of this mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard, under a well-defined system of inspection, testing and quality control during production. This system, which is devised and supervised by ISI and operated by the producer, has the further safeguard that the products as actually marketed are continuously checked by ISI for conformity to the standard. Details of conditions, under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

*Recommended practice for radiographic examination of fusion welded butt joints in steel plates (first revision).

†Recommended practice for radiographic examination of fusion welded circumferential joints in steel pipes.

‡Code of practice for liquid penetrant flaw detection.

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Base Units

Quantity	Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	Unit	Symbol
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	Unit	Symbol	Definition
Force	newton	N	1 N = 1 kg.m/s ²
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m ²
Frequency	hertz	Hz	1 Hz = 1 c/s (s ⁻¹)
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	Pascal	Pa	1 Pa = 1 N/m ²

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